Yumed Text
OPEN ACCESS JOURNALS

Spine: Open Access

Case Study | Vol 1 Iss 1

Rehabilitation of Post-operative Anterior Cervical Discectomy and Fusion- A Case Study

Stephen Christopher Owens*, Eric Anderson, Kenneth Graber and Collin Rekowski

Hampton University School of Science, Doctor of Physical Therapy Program, Hampton, USA

***Corresponding author:** Owens SC, Hampton University School of Science, Doctor of Physical Therapy Program, Hampton, USA, Tel: (757) 727-5847; E-mail: stephen.owens@hamptonu.edu

Received: December 12, 2018; **Accepted:** December 17, 2018; **Published:** December 20, 2018

1. Introduction

The Cervical radiculopathy is a condition that occurs in the cervical spine and involves pathology of the cervical nerve roots. Cervical radiculopathy is a condition that occurs in 83 per 100,000 persons annually [1]. This condition can occur as a result of nerve root compression due to intervertebral disc herniation as well as foraminal stenosis [2-3]. Patients frequently experience neck pain along with upper extremity dysfunction such as diminished sensation, decreased strength, and alterations in motor function [4]. In some cases, conservative interventions fail to resolve these symptoms, and surgical procedures become the primary consideration for management. Anterior cervical discectomy and fusion (ACDF) has been considered the gold standard for treating recalcitrant neurological deficits that occur as a result of cervical intervertebral disc herniation [5-6].

There is evidence that supports rehabilitation for cervical pain that focuses on motor control strategies emphasizing longus colli activation [7-9]. Falla et al. [10] demonstrated that decreased activation of the deep cervical musculature results in a delay of the automatic feed forward mechanism essential for stability during neck movement [10]. This alteration in the normal movement pattern may leave the neck vulnerable to damaging external forces.

Clinicians have also used neural mobilizations techniques for rehabilitation of patients with cervical radiculopathy [11-13]. These exercises are performed to improve nerve mobility, decrease nerve adherence and modulate pain symptoms [11]. Despite the use of various conservative rehabilitation techniques for patients with cervical radiculopathy, there is no consensus on the most effective therapeutic interventions for patients post-operative ACDF. The purpose of this case report is to describe the effects of a specific post-operative rehabilitation program on patient outcomes post-operative ACDF.

2. History

The patient was a 50-year-old male patient who was being seen for physical therapy following ACDF a C4-C5. Primary complains prior to surgery were upper extremity weakness and cervical pain. The patient was otherwise healthy with no

Citation: Owens SC, Anderson E, Graber K, et al. Rehabilitation of Post-operative Anterior Cervical Discectomy and Fusion- A Case Study. Spine Open Access. 2018;1(1):102.

significant medical history. At the time of initial evaluation, 33 days post-operative, patient had minimal complaints of pain and reports of improved strength. He was instructed by his physician to avoid active extension of the cervical spine. The physician did not provide any additional post-operative protocols.

3. Examination

The findings of the examination were as follows: Cervical spine flexion and extension were limited by 50%, side flexion was bilaterally limited by 75%, rotation to the right was limited by 20%, and rotation of the left was limited by 10%. Light touch sensation was normal with the exception of the C7 dermatome. Deep tendon reflexes were normal for biceps and triceps bilaterally, and for brachioradialis on the left, with brachioradialis on the right being mildly diminished. The craniocervical flexion test was performed based on the description by Jull et al. [14]. The patient is positioned in supine with the head in a neutral position, and a pressure cuff placed under the neck. The pressure cuff is then inflated to 20 mmHg. The patient is then asked to gently and slowly nod the head to increase the pressure cuff to 22 mmHg and to hold the position (2 mmHg increase). The patients' ability to maintain a 2 mmHg increase, without contraction of superficial neck musculature (example sternocleidomastoid), for ten seconds is evaluated.

The patient progresses by 2 mmHg until 30 mmHg (10 mmHg increase) can be performed without compensation. See FIG. 1. The results for the patient during the initial evaluation were as follows: the patient was able to perform the craniocervical flexion maneuver with 4 mm of mercury for a 5 second hold without compensation from the sternocleidomastoid or other superficial muscles.

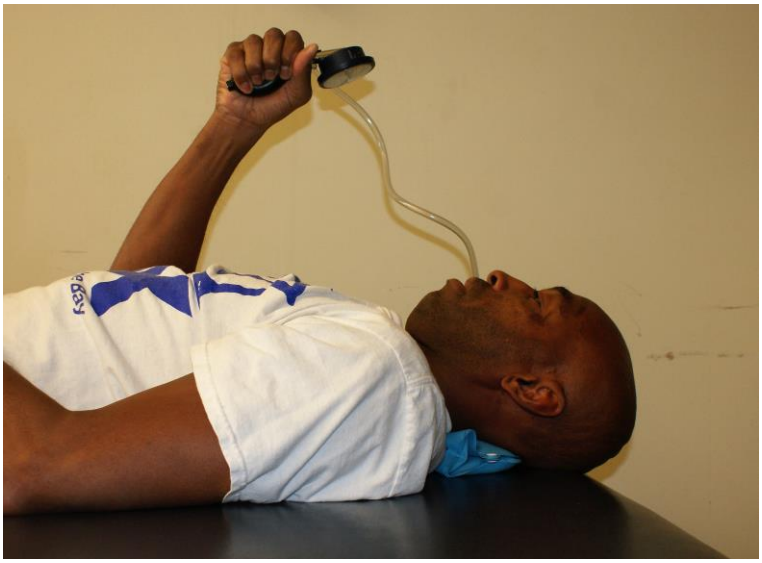

FIG. 1. **The results for the patient during the initial evaluation.**

All strength measurements were deferred at the time of the initial evaluation; however, strength was assessed two weeks prior to surgery. Resisted testing of the right upper extremity was conducted using a hand-held force dynamometer for the following measurements: shoulder abduction, shoulder external rotation, shoulder internal rotation, elbow flexion, and elbow extension. Each measurement was taken three times, with averages calculated. Results are reported in TABLE 1.

TABLE 1. **Dynamometer Strength Testing (Averages of 3 Trials).**

Right UE (Myotome)	Pre-Surgery (lbs)	Discharge (lbs)
Abduction (C5)	23	33.1
External Rotation (C5, C6)	21.7	29
Internal Rotation (C5, C6)	24.2	25.6
Elbow Flexion (C5, C6)	29.3	49
Elbow Extension (C7)	37.3	36.5

4. Interventions

During initial visit, the patient was given a home exercise program consisting of craniocervical flexion exercise for 5 repetitions of 5 second holds, twice daily with a target increase of 4 mmHg. The patient was instructed to perform a median nerve mobilization exercise. See description in FIG. 2. The patient was instructed to perform the nerve mobilization twice daily on both arms.

Fig. 2.1

Fig. 2.2

FIG.2. **2.1) The patient is positioned in supine with ipsilateral cervical side flexion, shoulder girdle elevated and elbow wrist and fingers fully extended. 2.2) The patient rhythmically flexes and extends the elbow while maintaining wrist and finger extension for 1 minute.**

One week after initial evaluation the patient reported increased neck "discomfort" during follow-up appointment. The therapist instructed the patient to reduce the level of effort during the craniocervical flexion exercise by 2 mmHg. Fourteen days after the initial evaluation the patient's complaints of "discomfort" abated and the exercise program was progressed. The therapist instructed the patient to increase the craniocervical flexion exercise effort to a cuff pressure increase of 6 mmHg. Additional exercises were introduced to include general cervicothoracic and shoulder strengthening. These exercises included serratus punches in a partial weight bearing position, trapezius low rows, and mid rows. Each was performed for 3 sets of 20 repetitions using a yellow theraband resistance twice daily.

5. Outcome

At the time of final follow-up, six months post initial evaluation, the patient had returned to all normal work and activities of daily living. The patient continued to present with mild pain and a 15 percent limit in cervical extension. All other cervical range of motion were within functional limits. The patient's upper extremity strength improved form his pre-surgery levels. See TABLE 1 for discharge strength measurements. The patient was discharged from physical therapy and encouraged to continue all home exercises.

6. Discussion

This case provides an example of a patient following a ACDF who demonstrated improvement in overall function, and reduction of symptoms while participating in a home based rehabilitation program. The program focused on progressive activation of the longus colli and nerve mobility exercise activities. The patient was able to perform all exercises at home without complications. The outlined exercise activities were consistent with prior studies that described the clinical benefits of nerve mobility activities and stabilization exercises for patients with cervical radiculopathy [11-13].

The most critical aspect of the patient's home rehabilitation protocol consisted of motor control strategies emphasizing activation of the longus colli. The therapist used biofeedback through a pressure cuff and verbal feedback to facilitate proper muscle activation in the clinical setting. This instruction was designed to carry-over to home-based exercise activity. Patients with a history of chronic neck pain display altered motor control patterns and a delay of the automatic feedforward mechanism to stabilize the neck during movement [10,15]. The cranicervical flexion exercise is designed to reestablish a more normal motor control pattern, while avoiding increased pain related to global muscle activation (upper trapezius and sternocleidomastoid). The therapist scheduled weekly follow-up to allow careful monitoring of progression and alterations to the treatment plan.

The final consideration for this patient's rehabilitation program was generalized strengthening of the cervical, thoracic, and shoulder regional musculature. Global strength and conditioning activities were preceded by the critical local stabilization activities emphasizing deep cervical flexor activity. Local stability was addressed and achieved prior to progress to general strength training exercise.

This case presents a cost-effective efficient rehabilitation protocol for patients post-operative following ACDF.

REFERENCES

1. Eubanks JD. Cervical Radiculopathy: Nonoperative Management of Neck Pain and Radicular Symptoms. Am Fam Physician. 2010;81(1):33-40.
2. Sizer PS Jr, Phelps V, Dedrick G, et al. Differential diagnosis and management of spinal nerve root-related pain. Pain Pract. 2002;2(2):98-121.
3. Sizer PS Jr., Phelps V, Brismee JM. Differential diagnosis of local cervical syndrome versus cervical brachial syndrome. Pain Pract. 2001;1(1):21-35.
4. Xie L, Liu M, Ding F, et al. Cervical disc arthroplasty (CDA) versus anterior cervical discectomy and fusion (ACDF) in symptomatic cervical degenerative disc diseases (CDDDs): an updated meta-analysis of prospective randomized controlled trials (RCTs). SpringerPlus. 2016;5(1):2851-8.
5. Bohlman HH, Emery SE, Goodfellow DB, et al. Robinson anterior cervical discectomy and arthrodesis for cervical radiculopathy. Long-term follow-up of one hundred and twenty-two patients. J Bone Joint Surg Am. 1993;75(9):1298-307.
6. Yue WM, Wai-Mun Y, Brodner W, et al. Long-term results after anterior cervical discectomy and fusion with allograft and plating. Spine. 2005;30(19):2138-44.
7. Iqbal ZA, R. Rajan SA, Khan AH, et al. Effect of deep cervical flexor muscles training using pressure biofeedback on pain and disability of school teachers with neck pain. J Phys Ther Sci. 2013;25(6):57-61.
8. Kim, JY, Kwang K. Clinical effects of deep cervical flexor muscle activation in patients with chronic neck pain. J Phys Ther Sci. 2016;28(1):269-73.
9. Lee, K, Won-Ho K. Effect of thoracic manipulation and deep craniocervical flexor training on pain, mobility, strength, and disability of the neck of patients with chronic nonspecific neck pain: a randomized clinical trial. J Phys Ther Sci. 2016;28(1):175-80.

10. Falla D, Bilenkij G, Jull G. Patients with chronic neck pain demonstrate altered patterns of muscle activation during performance of a functional upper limb task. Spine. 2004;29(13):1436-40.
11. Savva C, Giakas G. The effect of cervical traction combined with neural mobilization on pain and disability in cervical radiculopathy. A case report. Man Ther. 2013;18(5):443-46.
12. Sanz DR, Solano FU, Lopez DL, et al. Effectiveness of median nerve neural mobilization versus oral ibuprofen treatment in subjects who suffer from cervicobrachial pain: a randomized clinical trial. Arch Med Sci. 2018;14(4):871-79.
13. Kim DG, Chung SH, Jung HB. The effects of neural mobilization on cervical radiculopathy patients' pain, disability, ROM, and deep flexor endurance. J Back Musculoskelet Rehabil. 2017;30(5):951-59.
14. Jull GA, O'Leary SP, Falla DL. Clinical assessment of the deep cervical flexor muscles: the craniocervical flexion test. J Manipulative Physiol Ther. 2008;31(7):525-33.
15. Falla DL, Jull GA, Hodges PW. Patients with neck pain demonstrate reduced electromyographic activity of the deep cervical flexor muscles during performance of the craniocervical flexion test. Spine. 2004;29(19):2108-14.